MINE AND UNEXPLODED ORDNANCE CLEARING VEHICLE

【Technical Field】

The present invention relates to a vehicle with a land mine removing unit mounted thereto, and more particularly to a multi-purpose land mine and unexploded shell clearing vehicle that is capable of not only removing trees but also removing land mines laid in the ground where land mines are mixed with unexploded shells, chemical bombs, and bones, and therefore, rotary-type and flail-type land mine removing equipment that explodes and crushes the unexploded shells or the land mines is restrictedly used, as in a post-war country or in a mountainous area with dense tree growth, wherein tree removing devices and land mine removing devices are selectively attached to the vehicle in various fashions, thereby improving compatibility of the devices, maximizing applicability of the devices, and performing environmentally-friendly land mine removal at the area where unexploded shells, land mines, and bones are mixed or in a mountainous area with dense tree growth while environmental contamination and ecosystem destruction are minimized.

【Background Art】

One kind of land mine removing equipment which has been widely used up to now is the flail and rotary-type land mine removing equipment that explodes land mines to obtain safe passage for mobile equipment, such as tanks, in an open space during a war. However, this flail and rotary-type land mine removing equipment cannot be used in areas where land mines are mixed with unexploded shells, chemical bombs, and bones. Also, the price of the flail and rotary-type land mine removing equipment is very high. Furthermore, the land mine removing equipment is damaged when land mines are exploded, which considerably increases maintenance expenses for the land mine removing equipment. In addition, the environment is damaged and polluted when the land mine removing equipment is used. Consequently, the flail and rotary-type land mine removing equipment is not

suitable to perform land mine removal in post-war peaceful reconstruction. Furthermore, the flail and rotary-type land mine removing equipment is not suited to mountainous areas with dense tree growth.

Specifically, it is necessary to not only exhume bones, but also remove unexploded shells and land mines at the area where land mines are mixed with unexploded shells, chemical bombs, and bones, as in a post-war country. Consequently, land mine exploding and crushing equipment cannot be used in this case. The unexploded shells and the land mines must be removed while the bones are exhumed. In the case of removing land mines in mountainous areas, trees must be removed first to obtain a work space necessary to operate the land mine removing equipment. That is, the trees are manually removed first by workers, and then the land mines are removed by the land mine removing equipment. The bones are manually exhumed and the land mines removed. However, land mines may be exploded, causing heavy losses. Also, trees may come into contact with the land mines while the land mines are removed. As a result, the land mines are exploded, and therefore, people may be killed or injured. This is a very serious problem.

In order to solve the problem, the applicant of the present application has been filed a patent application, the contents of which are disclosed in Korean Unexamined Patent Publication No. 2002-0028747 (title of the invention: "LAND MINE CLEARING VEHICLE"). This publication discloses a land mine clearing vehicle that is capable of detecting land mines, searching for the detected land mines, and collecting the searched land mines while performing tree removal.

The construction of the land mine clearing vehicle disclosed in the above-mentioned publication is as follows. As shown in FIG. 1, a multi-joint link 10 is mounted to a vehicle body 1 such that the multi-joint link 10 can be moved forward and backward, from side to side, and upward and downward by hydraulic pressure supplied to a hydraulic pressure generating unit. To the front end of the multi-joint link 10 is a grip part 12. To the front end of a piston rod 22 of a hydraulic cylinder 20 connected to a predetermined position of the vehicle body 1 are attached a power saw 30 and a land mine detector 32, which are selectively used.

While the upper part of a tree to be cut is gripped by the grip part 12

attached to the front end of the multi-joint link 10, the lower end of the tree is cut by the power saw 30 attached to the front end of the piston rod 22 of the hydraulic cylinder 20.

When the tree is cut through the above-described cutting process, the land mine clearing vehicle is moved rearward or the vehicle body 1 of the land mine clearing vehicle is rotated to transfer the tree gripped by the grip part 12 to a safe place where no land mine is laid.

After the trees within a predetermined radius of the position of the land mine clearing vehicle are cut through the above-described process, the power saw 30 attached to the front end of the piston rod 22 of the hydraulic cylinder 20 is turned such that the land mine detector 32 is placed in front of the power saw 30.

When the vehicle body 1 of the land mine clearing vehicle is rotated in the above-mentioned state, the land mine detector 32 is turned about the vehicle body as the central axis to detect a land mine. When the land mine is detected by the land mine detector 32, paint is injected through a nozzle (not shown), which is connected to the land mine detector 32, to indicate location of the land mine.

After the land mine detection within the predetermined radius is finished as described above, as shown in FIG. 2, the grip part 12 is detached from the front end of the multi-joint link 10, and then a land mine removing and collecting bucket 40 is attached to the front end of the multi-joint link 10. The land mine is collected by the land mine removing and collecting bucket 40, and is then transferred to a safe place where the land mine is exploded.

In the conventional land mine clearing vehicle as described above, however, the grip part 12 or the land mine removing and collecting bucket 40 is selectively attached to the multi-joint link 10, and the power saw 30 and the land mine detector 32 are attached to the front end of the hydraulic cylinder 20 while the power saw 30 and the land mine detector 32 are arranged opposite to each other such that the power saw can be moved to the position where the land mine detector was previously disposed, and correspondingly, the land mine detector can be moved to the position where the power saw 70 was previously disposed. Consequently, although the price of the conventional land mine clearing vehicle is very high, the

conventional land mine clearing vehicle performs only predetermined operations. In other words, the conventional land mine clearing vehicle has limited applicability.

Current land mine detectors are a metal detector, by which a plastic land mine, such as an M14 antipersonnel land mine, cannot be detected. As a result, the plastic land mine is not effectively detected, and therefore, only a limited number of plastic land mines can be removed from post-war countries or countries where land mines must be removed for compliance with the international antipersonnel land mine prohibition agreement.

Consequently, the plastic land mines, which cannot be detected by the land mine detector, are exploded. In this way, the plastic land mines are removed. However, explosion of the plastic land mines causes serious environmental contamination and ecosystem destruction.

Specifically, dust and debris of the exploded land mines, generated when the plastic land mines are exploded, contaminate the soil, water, and air. Also, the extreme noise generated when plastic land mines are exploded may cause hearing lossin people and animals in the area where the plastic land mines are exploded.

Especially, the noise generated when antitank land mines are exploded is severe enough to injure the cochlear canals of animals within several tens of meters around the area where the antitank land mines are exploded, which causes abortion, sterility, and death of many animals.

【Disclosure】

【Technical Problem】

Therefore, the present invention has been made in view of the above problems, and it is an object of the present invention to provide a multi-purpose land mine and unexploded shell clearing vehicle that is capable of not only exhuming bones but also collecting land mines or unexploded shells without exploding the land mines or the unexploded shells in areas where land mines are mixed with unexploded shells, chemical bombs, and bones, as in a post-war country,

and is capable of not only removing trees but also removing land mines laid in the ground in a mountainous area with dense tree growth, wherein tree removing devices and land mine removing devices are selectively attached to the vehicle in various fashions, thereby improving compatibility of the devices, maximizing applicability of the devices, and wherein plastic land mines, which cannot be detected by a metal detector, are also collected and safely removed.

It is another object of the present invention to provide a multi-purpose land mine and unexploded shell clearing vehicle that is capable of collecting metal land mines and plastic antitank land mines laid in the ground without exploding the metal land mines and the plastic antitank land mines, and exploding only M14 plastic antipersonnel land mines, which generates minimal noise with negligible environmental contamination when exploded, thereby minimizing environmental contamination and ecosystem destruction.

【Technical Solution】

In accordance with the present invention, the above and other objects can be accomplished by the provision of a multi-purpose land mine and unexploded shell clearing vehicle comprising: a multi-joint link mounted to the vehicle having a vehicle body that is capable of rotating 360 degrees, the multi-joint link having a predetermined length and being capable of moving forward and backward, from side to side, and upward and downward by hydraulic pressure supplied from a hydraulic pressure generating unit; a grip part attached to a front end of the multi-joint link, the grip part being configured such that one side portion of the grip part and the other side portion of the grip part are moved toward each other by the supplied hydraulic pressure to selectively perform any one of tree gripping and land mine removal; a land mine removing means attachable to the front end of the multi-joint link instead of the grip part for performing land mine removal; a first hydraulic cylinder having one end connected to a predetermined position of the vehicle body such that the first hydraulic cylinder can be hingedly rotated not only in a vertical direction but also in a horizontal direction, the first hydraulic cylinder being configured such that the first hydraulic cylinder can be advanced and retracted by a

predetermined length; a circular saw rotatably attached to a front end of a first piston rod of the first hydraulic cylinder for cutting a predetermined lower end position of a tree; a circular saw-turning means for turning the circular saw attached to the first piston rod such that the circular saw can be turned from one side of the first piston rod to the other side of the first piston rod to cut the tree; and a land mine detector mounted to a fixing bracket attached to the front end of the first piston rod while being arranged opposite to the circular saw for detecting a land mine laid in the ground after the tree is cut.

Preferably, the multi-purpose land mine and unexploded shell clearing vehicle further comprises: a grass cutter rotatably attached to the front end of the first piston rod of the first hydraulic cylinder, instead of the circular saw, for cutting weeds or brush.

Preferably, the multi-purpose land mine and unexploded shell clearing vehicle further comprises: a bucket attached to the front end of the first piston rod of the first hydraulic cylinder, instead of the circular saw, allowing a worker riding in the bucket to perform tree removal and land mine detection.

Preferably, the land mine removing means is a high-pressure injector for injecting high-pressure air or high-pressure water into the ground such that the land mine laid in the ground is exposed.

Preferably, the land mine removing means is an antipersonnel land mine crusher for repeatedly striking the ground where the land mine is laid with a predetermined load to explode the land mine.

Preferably, the land mine removing means is a land mine crushing roller for pressing the ground where the land mine is laid with a predetermined load to explode the land mine.

Preferably, the land mine removing means is a magnetic adsorber for adsorbing and collecting metal debris of the exploded land mine by a magnetic force.

Preferably, the land mine removing means is a land mine-collecting vibratory scraping bucket, having scrapers arranged while being spaced a predetermined distance from each other such that an M14 antipersonnel land mine

does not pass through the space between the respective scrapers and a vibrating unit mounted thereto, for digging the ground where the land mine is laid to a predetermined depth and then allowing the soil to fall through the spaces between the scrapers through the vibrating operation of the vibrating unit to collect the land mine.

【Advantageous Effects】

The multi-purpose land mine and unexploded shell clearing vehicle according to the present invention has the following effects. According to the present invention, land mine removing devices and tree removing devices are selectively attached to the multi-purpose land mine and unexploded shell clearing vehicle in various fashions at the area where unexploded shells, land mines, and bones are mixed as in a post-war country or in a mountainous area with dense tree growth. Consequently, the present invention has the effect of improving compatibility of the devices, and therefore, maximizing applicability of the devices. Also, the plastic antitank land mine, which cannot be detected by the metal detector, is collected and then removed without exploding the plastic antitank land mine, and the M14 plastic antipersonnel land mine, which generates a small amount of dust and low explosive noise when exploded, is detonated. Consequently, the present invention has the effect of minimizing environmental contamination and ecosystem destruction, and therefore, performing environmentally-friendly land mine removal.

【Description of Drawings】

The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a view illustrating a conventional land mine clearing vehicle when the vehicle is used to remove trees;

FIG. 1 is a view illustrating the conventional land mine clearing vehicle when the vehicle is used to remove land mines;

FIG. 3 is a view illustrating a land mine clearing vehicle when the vehicle is used to remove trees in accordance with a preferred embodiment of the present invention;

FIG. 4 is a view illustrating a circular saw and a land mine detector assembled with each other by a rack and pinion according to the present invention;

FIG. 5 is a view illustrating a grass cutter and a land mine detector assembled with each other by the rack and pinion according to the present invention, the grass cutter replacing the circular saw;

FIG. 6 is a view illustrating the land mine clearing vehicle when the vehicle is used to remove trees in accordance with another preferred embodiment of the present invention;

FIG. 7 is a view illustrating the land mine clearing vehicle with a high-pressure injector as land mine removing means according to the present invention;

FIGS. 8 and 9 are views respectively illustrating the land mine clearing vehicle with an antipersonnel land mine crusher as land mine removing means according to the present invention;

FIG. 10 is a view illustrating the land mine clearing vehicle with a land mine crushing roller as land mine removing means according to the present invention;

FIG. 11 is a view illustrating the land mine clearing vehicle with a magnetic adsorber as a land mine removing means according to the present invention; and

FIG. 12 is a view illustrating the land mine clearing vehicle with a vibratory scraping bucket as land mine removing means according to the present invention.

【Best Mode】

Now, preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings.

FIG. 3 is a view illustrating a land mine clearing vehicle when the vehicle is used to remove trees in accordance with a preferred embodiment of the present

invention, FIG. 4 is a view illustrating a circular saw and a land mine detector assembled with each other by a rack and pinion according to the present invention, FIG. 5 is a view illustrating a grass cutter and a land mine detector assembled with each other by the rack and pinion according to the present invention, the grass cutter replacing the circular saw, and FIG. 6 is a view illustrating the land mine clearing vehicle when the vehicle is used to remove trees in accordance with another preferred embodiment of the present invention.

FIG. 7 is a view illustrating the land mine clearing vehicle with a high-pressure injector as land mine removing means according to the present invention, FIGS. 8 and 9 are views respectively illustrating the land mine clearing vehicle with an antipersonnel land mine crusher as land mine removing means according to the present invention, FIG. 10 is a view illustrating the land mine clearing vehicle with a land mine crushing roller as land mine removing means according to the present invention, FIG. 11 is a view illustrating the land mine clearing vehicle with a magnetic adsorber as land mine removing means according to the present invention, and FIG. 12 is a view illustrating the land mine clearing vehicle with a vibratory scraping bucket as land mine removing means according to the present invention.

Referring first to FIG. 3, a multi-joint link 50, which is actuated in a hydraulic fashion, is usually used for a link crane or an excavator. Link members of the multi-joint link 50 are spread or folded based on how hydraulic pressure is supplied such that the horizontal length and the vertical height of the multi-joint link 50 can be adjusted. A gripping part 52, which is attached to the front end of the multi-joint link 50, is used to prevent a tree from falling down when the lower end of the tree is cut by a circular saw 70, which will be described below in detail, and, after the tree is cut, to securely grip the cut tree when the tree is transferred to a safe place where no land mines and unexploded shells are laid.

The grip part 52 is configured such that one side portion of the grip part and the other side portion of the grip part are moved toward each other simultaneously when a cap piston rod 54 is advanced as hydraulic pressure is supplied. Since the grip part 52 is actuated as described above, the tree can be tightly gripped by the grip

part 52.

The grip part 52 is attached to the front end of the multi-joint link 50 such that the grip part 52 can be hingedly rotated in a horizontal direction by a hydraulic motor.

To a predetermined position of a vehicle body 1, to which the multi-joint link 50 is mounted, is attached one end of a first hydraulic cylinder 56 such that the first hydraulic cylinder 56 can be hingedly rotated not only in a vertical direction but also in a horizontal direction. The first hydraulic cylinder 56 is configured such that a first piston rod 58 of the first hydraulic cylinder 56 is advanced or retracted based on how hydraulic pressure is supplied, as in the multi-joint link 50, and therefore, the length of the rod 58 can be adjusted.

To the front end of the first piston rod 58 of the first hydraulic cylinder 56 mounted to the vehicle as described above are attached a circular saw 70 and a land mine detector 72. One end of the circular saw 70 is connected to a pinion 66. The pinion 66 is engaged with a rack 64, which is formed at a second piston rod 62 of a second hydraulic cylinder 60 for rotating the pinion 66. As a result, the circular saw 70 is disposed below the first piston rod 58 as shown in FIG. 4.

Preferably, a fixing bracket 68 is disposed below the pinion 66 such that the land mine detector 72 is attached to the fixing bracket 68 while being opposite to the circular saw 70. When the pinion 66 is rotated by the rack 64 as the second piston rod 62 is advanced, the circular saw 70 is turned, and at the same time, the land mine detector 72 is turned. Consequently, the circular saw 70 and the land mine detector 72 can be selectively used.

When the circular saw 70 is turned 180 degrees about the pinion 66 in the case that the circular saw 70 and the land mine detector 72 are symmetrically disposed below the pinion 66 while being opposite to each other, the circular saw 70 is moved to the position where the land mine detector 72 was previously disposed, and correspondingly, the land mine detector 72 is moved to the position where the circular saw 70 was previously disposed. Consequently, the land mine detector 72 can be used according to operator's intention after the circular saw 80 has been used.

First, the operator controls the multi-joint link 50 such that the position

two-thirds of the way to the top of the tree to be cut is gripped by the grip part 52 attached to the front end of the multi-joint link 50, and fixes the multi-joint link 50 such that the multi-joint link 50 cannot move while the tree is gripped by the grip part 52 of the multi-joint link 50.

Thereafter, the operator supplies hydraulic pressure to the first hydraulic cylinder 56 such that the first piston rod 58 can be advanced to the lower end of the tree gripped by the grip part 52, and then moves the circular saw 70 to the position where the tree can be cut by the circular saw 70.

When the circular saw 70 is placed at the side of the predetermined position of the lower end of the tree as described above, the operator actuates the circular saw 70 to cut the tree. At this time, an additional reduction gear (not shown) is preferably to attached to the pinion 66 for preventing the circular saw 70 from rotating at too high a speed. In this way, the tree may be cut in a more stable manner. When the multi-joint link 50 lifts up the tree with a predetermined force while the tree is gripped by the grip part, or when the grip part 52 is hingedly rotated by a predetermined degree, the circular saw 70 is prevented from being tightly caught between the opposite cut surfaces of the tree cut by the circular saw 70. Consequently, more stable cutting is accomplished.

When the tree is cut through the above-mentioned cutting process, the operator retracts the second piston rod 62 or the first piston rod 58 to its original position depending upon the state of trees around the land mine clearing vehicle.

Thereafter, the operator drives the land mine clearing vehicle backwards or rotates the vehicle body 1 to transfer the cut tree, which is gripped by the grip part 52, to a safe place where no land mines and unexploded shells are laid. In this way, tree removal is accomplished.

Also, a grass cutter 74 may be used, instead of the circular saw 70, to cut weeds or brush, as shown in FIG. 5.

The grass cutter 74 is disposed at the front end of the first piston rod 58 while the grass cutter 74 is attached to a rotary shaft, which is rotated at high speed by a power unit. The operator moves the grass cutter 74 such that the grass cutter 74 approaches a thicket of weeds or brush. The weeds or the brush are cut by the

grass cutter 74 as the grass cutter 74 is rotated. In this way, grass removal is accomplished.

This grass removal using the grass cutter 74 may be accomplished in the same way as the previously mentioned tree removal. After the grass removal is finished, the grass cutter 74 is turned 180 degrees such that the grass cutter 74 is moved to the position where the land mine detector 72 was previously disposed, and correspondingly, the land mine detector 72 is moved to the position where the grass cutter 74 was previously disposed. Consequently, the land mine detector 72 is ready to be used.

As the power unit for rotating the grass cutter 74, there is used a hydraulic motor which is driven by the hydraulic pressure of the multi-joint link 50. Consequently, costs incurred through the provision of an additional hydraulic pressure-generating unit are eliminated.

In accordance with another preferred embodiment of the present invention, a bucket 76, in which a worker rides, is attached to the front end of the first piston rod 58 of the first hydraulic cylinder 56, as shown in FIG. 6.

At the rear part of the bucket 76 is formed a fixing part (not shown), which is detachably attached to the front end of the first piston rod 58. The bucket 76 is attached to the front end of the first piston rod 58 by means of the fixing part. Consequently, the bucket 76 can be moved to a predetermined place as the operator rotates the first hydraulic cylinder 56 in the vertical and horizontal directions and advances or retracts the first piston rod 58.

At this time, the fixing part of the bucket 76 may be attached to the first piston rod 58 by means of pins or bolts, which are common fixing members.

The worker rides in the bucket 76, and then the operator of the land mine clearing vehicle actuates the first hydraulic cylinder 56 and the first piston rod 58 to guide the bucket 76 toward the tree to be cut. Thereafter, the worker uses a portable cutter 78, which is commonly used, to cut the tree. The cut tree is removed by the grip part 52, and then the worker uses a portable metal detector to perform land mine detection.

At this time, the worker may use a portable grass cutter to remove the

weeds or brush.

After the trees within a predetermined radius of the position of the land mine clearing vehicle are cut through the above-described process, the metal detector 72 is used to detect a metal land mine or an unexploded shell within a rotating radius of the land mine clearing vehicle. When the metal land mine or the unexploded shell is detected by the metal detector 72, paint is injected to indicate the position where the metal land mine or the unexploded shell is detected.

When the position of the metal land mine or the unexploded shell is detected as described above, the operator actuates the grip part 52 attached to the front end of the multi-joint link 50 while watching the position of the metal land mine or the unexploded shell with the naked eye or through an unmanned camera such that the grip part 52 penetrates into the ground corresponding to the position indicated by the paint while the side portion of the grip part and the other side portion of the grip part are moved toward each other to grip the detected metal land mine or the detected unexploded shell. After gripping the detected metal land mine or the detected unexploded shell, the grip part 52 lifts up the gripped metal land mine or the gripped unexploded shell, and then removes soil from the lifted metal land mine or the lifter unexploded shell. Subsequently, the metal land mine or the unexploded shell is transferred, by the grip part, to a safe place where no land mines and unexploded shells are laid.

In accordance with the present invention, various land mine removing means may be used, instead of the grip part 52, to remove land mines in various ways.

FIG. 7 is a view illustrating the land mine clearing vehicle with a high-pressure injector 90, which injects air or water at high pressure, as land mine removing means, which replaces the grip part 52. The high-pressure injector 90 is attached to the front end of the multi-joint link 50.

The high-pressure injector 90 comprises a pressurizing pump 94 attached to an injector body 92 for pressurizing air or water introduced through an inlet hose 96, and an injection hose for injecting air or water pressurized by the pressurizing pump 94. When high-pressure air or high-pressure water is injected

into the ground where the land mine is laid using the high-pressure injector 90 such that the land mine laid in the ground is exposed. In this way, the land mine is collected.

The high-pressure injector 90 is used to collect and then remove a plastic mine, which is not detected by the land mine detector 72. Especially, the high-pressure injector 90 is used to expose and then collect an antitank land mine, which generates a large amount of dust and extreme explosive noise when the antitank land mine is exploded, whereby environmental contamination and ecosystem destruction are minimized.

More preferably, an injection member may be formed at a predetermined position of the grip part 52 instead of using the high-pressure injector 90, and a pressurizing pump is mounted to a predetermined position of the land mine clearing vehicle such that the injection member is connected to the pressurizing pump. In this way, the grip part 52 serves as the high-pressure injector 90 with the result that the troublesome replacement is eliminated, and thus, the work time is reduced.

FIG. 8 is a view illustrating the land mine clearing vehicle with an antipersonnel land mine crusher 80 as land mine removing means according to another preferred embodiment of the present invention. The antipersonnel land mine crusher 80 has a connection part 84 formed at the upper part of the crusher body 82. The antipersonnel land mine crusher 80 is connected to the front end of the multi-joint link 50 through the connection part 84. The antipersonnel land mine crusher 80 repeatedly strikes the ground where the land mine is laid with a predetermined load while the antipersonnel land mine crusher 80 is moved, whereby the land mine is exploded.

To one side of the crusher body 82 of the antipersonnel land mine crusher 80 is attached a hydraulic motor 86. When the hydraulic motor 86 is actuated, an eccentric cam (not shown), which is mounted in the crusher body 82 while being connected to the hydraulic motor 86 via a shaft, is rotated, and therefore, a rotary roller (not shown) disposed below the eccentric cam is pushed downward by the eccentric size. As a result, a vibratory plate 87 is alternately moved upward and

downward such that the ground is repeatedly struck with a predetermined load.

The construction of such an antipersonnel land mine crusher 80 may be derived from the construction of a ground-hardening compactor used in a foundation work of a building or a road, and therefore, a detailed description, in operating structure and operating principle, of the antipersonnel land mine crusher will not be given.

At the lower part of the vibratory plate 87 of the antipersonnel land mine crusher 80 are formed a plurality of pressurizing bars 89, which are arranged while being spaced a predetermined distance from each other. Consequently, the pressurizing bars 89 strike the land mine laid in the ground to explode the land mine as the vibratory plate 87 repeatedly strikes the ground. Preferably, the distance between the respective pressurizing bars 89 is approximately 3 to 5 cm such that an M14 antipersonnel land mine (ankle land mine: 5.5 cm in diameter and 4 cm in width) can be exploded by pressurizing bars 89 without the M14 antipersonnel land mine being placed in the space between the respective pressurizing bars 89.

FIG. 9 is a view illustrating an antipersonnel land mine crusher 80' according to another preferred embodiment of the present invention. To the antipersonnel land mine crusher shown in the drawing may be applied the principle of a breaker used to destroy and remove walls or the ground at a construction site.

The antipersonnel land mine crusher 80' has a hammer (not shown) mounted therein. The hammer strikes a chisel 89' as the hammer is moved downward by hydraulic pressure, and therefore, the chisel 89' strikes the land mine to explode the land mine while being moved downward by the hammer.

As described above, the antipersonnel land mine crushers 80 and 80' directly strike the ground where the land mine is laid. Consequently, the antipersonnel land mine crushers 80 and 80' can explode the plastic land mine, which is not detected by the land mine detector, especially the M14 plastic antipersonnel land mine, which is exploded with minimized environmental contamination and minimized ecosystem destruction. In this way, the plastic land mine is removed.

FIG. 10 is a view illustrating the land mine clearing vehicle with a land mine crushing roller 110 as land mine removing means according to another preferred embodiment of the present invention. The land mine crushing roller 110 is attached to the front end of the multi-joint link 50.

The land mine crushing roller 110 is rotated as a motor 112 is driven. The land mine crushing roller 110 is provided at the outer circumferential surface thereof with a plurality of pressing protrusions 114, which press the ground with a predetermined load to explode the land mine laid in the ground. In this way, the land mine is removed.

The land mine crushing roller 110 is also used to explode and thus remove the M14 plastic antipersonnel land mine, as in the antipersonnel land mine crushers 80 and 80'.

FIG. 11 is a view illustrating the land mine clearing vehicle with a magnetic adsorber 100 as land mine removing means according to another preferred embodiment of the present invention. The magnetic adsorber 100, which is attached to the front end of the multi-joint link 50, is used to adsorb and collect metal debris of the exploded land mine by a magnetic force.

The magnetic adsorber 100 may be configured to use an electromagnetic force or to control a magnetic force generated from a magnet block consisting of a plurality of stacked magnets without using an electromagnet such that the metal debris of the exploded land mine can be adsorbed and removed by the magnetic adsorber 100.

When using electromagnetic force, an electric wire is connected to the inside of the magnetic adsorber 100. In the case of using the magnets, on the other hand, the magnet block is mounted in the magnetic adsorber 100. The magnetic adsorber is commonly used in the relevant industries, and therefore, a detailed description, in structure and principle, of the magnetic adsorber will not be given.

After the land mine laid in the ground is exploded by the antipersonnel land mine crusher 80 or 80' or the land mine crushing roller 110, which was described in detail above, the operator detaches the antipersonnel land mine

crusher 80 or 80' or the land mine crushing roller 110 from the frond end of the multi-joint link 50, and then attaches the magnetic adsorber 100 to the frond end of the multi-joint link 50. Subsequently, the operator rotates the vehicle body 1 of the land mine clearing vehicle while the magnetic adsorber 100 is spaced a predetermined distance form the ground. As a result, the magnetic adsorber 100 is turned about the land mine clearing vehicle as the central axis to adsorb metal debris of the exploded land mine scattered on the ground and in the ground within a rotating radius of the land mine clearing vehicle. In this way, the metal debris of the exploded land mine is collected. Also, the magnetic adsorber may be used to adsorb metal materials while being turned on the ground where the land mine detection using the land mine detector will be performed in order to prevent the land mine detector from being wrongly operated due to the metal materials while the land mine detection is performed using the land mine detector. In this case, the time necessary to detect the land mine is reduced.

FIG. 12 is a view illustrating the land mine clearing vehicle with a vibratory scraping bucket 120 as land mine removing means according to yet another preferred embodiment of the present invention. The vibratory scraping bucket 120, which is attached to the front end of the multi-joint link 50, is provided with scrapers 121, which are arranged while being spaced a predetermined distance from each other such that the M14 antipersonnel land mine does not pass through the space between the respective scrapers 121. To the vibrating scraping bucket 120 is attached a vibrating unit 122. When the operator digs the ground where the land mine is laid to a predetermined depth using the vibratory scraping bucket 120, and then vibrates the vibratory scraping bucket 120, the soil falls through the spaces between the scrapers 121. As a result, only the land mine is placed in the vibratory scraping bucket 120. Preferably, the scrapers 121 are arranged while being spaced apart from each other by a distance of 4 cm such that only the M14 antipersonnel land mine is collected and the soil falls through the spaces between the scrapers 121. The vibrating unit 122 may be operated in a hydraulic fashion or in a current-driven fashion.

As described above, the tree-removing and land mine-collecting grip part

52, the land mine-collecting vibratory scraping bucket 120, the antipersonnel land mine crusher 80 and 80', the high-pressure injector 90, the magnetic adsorber 100, and the land mine crushing roller 110, which are selectively attached to the front end of the multi-joint link 50 can be freely moved according to operator's intention through the actuation of the multi-joint link 50 that can be moved forward and backward, from side to side, and upward and downward, and the rotating operation of the vehicle body 1 of the land mine clearing vehicle.

【Industrial Applicability】

As apparent from the above description, the land mine removing devices and the tree removing devices are selectively attached, in various fashions, to the land mine clearing vehicle that is capable of removing land mines laid in the ground as well as exhuming bones at the area where unexploded shells, land mines, and bones are mixed as in a post-war country or in a mountainous area with dense tree growth. Consequently, the present invention has the effect of improving compatibility of the devices, and therefore, maximizing applicability of the devices.

Furthermore, the plastic antitank land mine, which cannot be detected by the metal detector, is collected and then removed without exploding the plastic antitank land mine, and the M14 plastic antipersonnel land mine, which generates a small amount of dust and low explosive sounds when exploded, is detonated. Consequently, the present invention has the effect of minimizing environmental contamination and ecosystem destruction, and therefore, performing environmentally-friendly land mine removal.